JPRS-UEA-84-005

27 February 1984

USSR Report

ECONOMIC AFFAIRS

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-UEA-84-005

27 February 1984

USSR REPORT

Economic Affairs

Contents

RESOURCE UTILIZATION AND SUPPLY

OPTIMAL UNITS OF MEASURE IN PRODUCTION SOUGHT

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 12, Dec 83 pp 109-113

[Article by A. Mikhel' from Tselinograd: "The Unit of Measurement--An Active Tool for Influencing Production"]

[Text] One of the basic features in economic development at the present stage is the ever-growing amount of raw materials, fuel and energy involved in the production process with a simultaneous increase in the proportional outlays for ensuring their increase; this is caused by natural factors and influences a further rise in the effectiveness of social production. This necessitates a careful examination and study of the possibilities for an effective economic influence on production in the aim of a maximum savings of material resources per unit of finished product.

The various stages in the production processing of the initial natural products from a raw material to a finished article demand corresponding units of measurement the establishing of which is determined primarily by the particular features of accounting for production and then the distribution, consumption or subsequent production cycle. Due to the natural deepening of specialization processes, the individual stages of processing the product are performed by various economically or departmentally separated enterprises and organizations. The chief link in the relationships between them is the sales indicator (or a variety of it) based upon the existing prices. Let us assume that the first enterprise has received raw materials and after the corresponding manufacturing has obtained a certain product. The production outlays for its creation are formed from the expenditures of previous, embodied and live labor. In the total expenditures of past labor the predominant role for a majority of the industrial sectors is played by raw products, materials and preassembled articles. In creating a unit of new product, the second enterprise uses the material manufactured by the first enterprise and here the price of the initial material is transferred fully to the costs of a unit of the manufactured product but within the corresponding expenditure standards.

The consumer properties of a majority of the produced materials and articles are formed considering geometric parameters (lumber, paper, rolled metals and so forth) in contrast to others where size does not play a role (cement, paper or coal). Geometric parameters are established for a produced product by standards which are calculated on the basis of the combined achievements of science, technology and practical experience. Since a product is produced at enterprises

which differ in terms of the degree of technical equipping, the accuracy of the product's geometric parameters (that is, the deviations from the nominal dimensions toward positive or negative tolerances) depends upon the specific performance of the equipment and the skills of the operating personnel. Because of this, the amount of dimensional deviations to both sides from the nominal forming the tolerance field is determined in the standards depending upon the average sectorial development level of the productive forces. The establishing of optimum standards plays a significant role in the economic consumption of materials per unit of product. The solving of this question assumes particular significance in the material-intensive types of production where an increase in product strength requires a significant rise in its volume.

If the selling price of steel sheet is calculated by its weight in tons, then an enterprise will be interested in operating with plus tolerances. Definite structural shifts will occur in the selling price. The expenditures of past labor, in comparison with the production of nominal-thickness sheet, will rise as will the indicator for plan fulfillment (sales). Profit will increase insignificantly in proportion to the sales volume.

If in setting the price for the sales of the produced steel sheet they employ a square meter as the unit of measurement, the enterprise will find it advantageous to operate with minus tolerances. In this instance the expenditures of past labor and costs can be reduced while profit will grow to a greater degree, since the amount of reducing costs due to the savings in the expenditures of previous labor will be fully transferred to profit. Thus, a unit of measurement substantially influences the production process or more accurately, the fuller utilization of the expenditures of past labor.

This principle will be maximally employed in working out the new wholesale prices. Very many product types with the help of the unit of measurement are aimed at the saving of resources. At the same time, the reserves for saving resources by employing resource-saving units of measurement in setting prices cannot be considered exhausted. Many of these units of measurements greatly complicate the accounting of production operations and their employment is considered ill-advised. But since the savings of material resources in the present stage of economic development has moved to the forefront, obviously one can allow a certain complicating of accounting operations. As an example, let us examine the process of the production and distribution of rolled metal. On the one hand, the necessity of saving resources and, on the other, the complexity of employing those units of measurement which would help to realize this necessity have led to a compromise solution: the weight established from the nominal dimensions of rolled products is accepted as the basis for setting the wholesale price. The procedure for accepting and dispatching rolled metal delivered by theoretical weight has been set down in the standard technological instructions approved by the USSR Gossnab [State Committee for Material-Technical Supply] and the USSR Minchermet [Ministry of Ferrous Metallurgy] in 1976. Later the VNIIOchermet [All-Union Scientific Research Institute for the Organization of Ferrous Metallurgy] worked out a special regulation on the delivery of rolled metal according to theoretical weight.

Here the interests of the consumer do not suffer, since the consumer properties of sheet metal--the area and its strength characteristics determined by the

standard--are maintained. Without any doubt, this is a progressive form of settlement between suppliers and consumers making it possible to save metal. However, the settlement method has validly been criticized by both suppliers and consumers.

In the first place, the determining of the conversion factor is rather complex and the accuracy of its calculation is based upon the consideration of probability factors. Secondly, the proportional amount of the delivery of metal by theoretical weight in the total volume of the delivery is insignificant and is employed only in instances when the tolerances are negative ones but when the enterprises produce a product with plus tolerances the metal is delivered by actual weight. Thirdly, the main task for fully converting to settlements for the theoretical weight can ultimately not be carried out, since the initiative in settling these questions has been granted fully to the manufacturing enterprises. The consumers also assume a passive stance on this question since for them the receiving of metal by theoretical weight means, on the one hand, a complicating of settlements and, on the other, deprives them of the opportunity (as in the delivery of increased-weight elements) to write off the material.

Considering all of this, it can be concluded that payment settlements for a theoretical weight play a definite positive role in the saving of metal. But at the same time, it is valid to raise the question of introducing resource-saving units of measurement if only at those enterprises where the achieved technical level of production makes it possible to produce rolled products with negative tolerances. The resource-saving unit of measurement has a more active effect than settlements for the theoretical weight on saving metal in the production process.

In actuality the process of calculating, for example, channel-iron in linear meters while rolled sheet is in square meters will somewhat complicate the planning of the production, distribution and consumption of rolled products. At the Solikamsk Pulp-Paper Combine and for its consumers they have introduced the measuring of the produced paper in square meters and although this is complicated it has been advantageous and essential from the viewpoint of saving resources.

Also important is the factor that any consumer of the rolled metal determines metal consumption for an article by geometric parameters and only then converts this into a weight quantity.

In addition to what has been stated, it is essential to consider the impact of the measurement units on reducing metal intensiveness, for example, in construction, by further introducing high-strength reinforcing iron, economic shapes and so forth. This influence is manifested, on the one hand, in an opportunity to more fully bring consumer value into conformity with the useful effect included in a unit of product. On the other hand, the price set by the resource-saving measurement unit can serve as a permanent point for calculating the reduced costs in determining the actual savings of expenditures in previous labor due to the increased useful effect of a unit of product and, consequently, encourage the output of light rolled products.

A significant savings in metal can be achieved only with a substantial economic encouragement of production. The employment of resource-saving units of

measurement as the carrier of the price would make this process more comprehensible and clearer. Thus, increasing the wholesale price level up to their conformity to the metal saving indices would lead to a stronger intensification of heat-strengthened reinforcing rod (as a whole reinforcing rod for reinforced concrete structures is in short supply) and consequently would provide a significant savings in metal.

One of the basic indicators for the production activities for enterprises and organizations is the sales volume. At first glance, the sales volume, in generally describing in cost terms the results of the economic operations of enterprises and organizations, reflects the measure of created consumer value as the total produced product multiplied by the price of a unit. However, this is true only in the instance if the product is of a small range and the unit of measurement for setting the manufacturer's price mechanically coincides with that at which the product is offered to the consumers.

With multiproduct production, such an approach causes significant losses. Any product is a consumer value only in the instance that it satisfies the demand for which it was produced. If the product does not move, then it brings not benefit to society but rather losses. In its sale, there should be an incentive for an active effect on its movement (circulation). This incentive should operate specifically in creating conditions for the complete sales of a broad-range product. This question assumes exceptional importance in construction. For example, a standard five-story modular building requires 130 different types of product from various suppliers. If, for example, one element of the first floor is unavailable, the installation of the next one cannot be completed. Since at present with the existing ties it makes absolutely no difference to the supplier, from the economic viewpoint, for what floor an element is delivered, the projects under construction receive what the plant is producing and not what is required according to the installation procedure. Moreover, it is economically advantageous for the plant to deliver material-intensive elements to the project. Due to various organizational and economic factors, the construction workers are forced to accept what is given to them, a large amount of assembly elements and other materials pile up at the construction sites and these can be used only after an extended time. This problem cannot be solved by any administrative measures.

Theoretically this situation is explainable by the ignoring of the planning principle in the circulation of productive capital between the industrial enterprises producing building materials and structural elements and construction work directly. The capital which has assumed a commodity form at the industrial manufacturing enterprises through the supply bodies is sold to the consumer, that is, to the construction and installation organizations. The active sales (the receipt of money on the manufacturer's payment account) serves as an indication that the commodity in terms of value, quality and delivery date conforms to the social demand, that is, is a consumer value. For example, a reinforced concrete element plant sells a stairway to a construction administration as a consumer value. In actuality this stairway will be employed in production only as part of a set with other elements and materials supplied frequently by different enterprises. In construction by a set one must understand a range of structural elements and materials which in their aggregate are a necessary condition for their complete use with a readiness sufficient for

carrying out subsequent work. A characteristic feature is the relatively long cycle for delivering the set to the project running from several days to several weeks. With the existing forms of economic relations between the manufacturer, the supply bodies and the consumer, the values of an incomplete set and subsequent sets delivered to the project are artificially excluded from circulation. Here the capital is considered sold but has not gone into production. Formally for the industrial enterprises the sale of incomplete products is the fulfillment of the plan indicators but at the same time the product cannot be used. It turns out that the circulation of capital is carried out according to the plan but ever-larger amounts are diverted into stocks without reaching production. As a result, the stocks of building materials and elements increase for the contracting organizations.

In the aim of improving material and technical supply for construction, in the mid-'60s they began establishing production assembly administrations as part of the trusts. But separated from the direct consumers, that is, the construction administrations, and economically not tied to the construction of specific projects, they were turned into passive, semitransit supply organizations. The administrations will become an actually progressive form of supply in construction only when the payments with the manufacturing plants are made for a complete plant set and with the construction administrations for a full production set (a production set can consist of several plant sets produced by different manufacturers). The question of payments for the set is pertinent not only in construction but also in other sectors. There can be no doubt that above-norm stocks lead to significant losses in both live and past labor.

The principle of a resource-saving effect on the production process with the employment of a wide range product is apparent if the plant (production) set is employed as a unit of measurement in the settlements between the manufacturer (supplier) and consumer.

An attempt to settle this question has been made in construction. The USSR Gosstroy, with the approval of the USSR Gosbank and the USSR Stroybank, in 1977 worked out the Recommendations for Organizing and the Payment Procedure for Complete Deliveries of Structural Elements and Parts. In a joint accompanying letter, there were plans to basically complete the changeover in 1977-1978 to supplying the projects with elements and parts in the form of production sets paid for after the complete delivery of the entire set. The designated dates passed however the actual introduction of payments for sets has made virtually no headway.

The basic reason for the unsuccessful introduction of payments for a set between suppliers and consumers lies in underestimating the scale of the initiated work and, as a consequence, the insufficient organizational and technical preparation. In terms of the scale of preparatory work and the impact on the production process, the introduction of payments for sets of building materials and structural elements between the suppliers (manufacturers) and the contracting organizations would be tantamount to introducing into practice payments between the contracting organizations and client organizations for fully completed projects which are ready to turn out a product or provide services.

Consideration was not given to the significant difficulties which the industrial enterprises and their superior bodies would encounter. Each trust (glavk [main administration]) has its own industrial enterprises and, consequently, an indicator for industrial product sales which is equal to such indicators as the fulfillment of construction and installation and the completion of the project. Here the plan for construction and installation often is not fulfilled with the fulfillment of the industrial product sales plan. Understandably the volume of produced product from the industrial enterprises does not increase immediately from introducing payments for a set and on the contrary sales will drop at first. For this reason the enterprises consciously do not want to reduce this indicator. Moreover, the transition to complete sales requires great and painstaking production preparations.

Under the conditions of the presence of enterprises which do not intend to introduce payments for sets, it is essential to plan the introduction of payments for the delivery of sets both for the construction organizations and for the building industry enterprises. It is essential to consider the fact that the transition to payments for a set between the supplier and consumer cannot be viewed as an end in itself. At small-sized enterprises its introduction is not advised while at large ones, conversely, payments for a complete set should become the predominant form.

Also important is the fact that the payments for the delivery of a complete set of structural elements and materials require the appropriate legal support. The current rules for the delivery of production- and technical-end products theoretically permit the delivery of sets of structural elements and materials. But the very concept of a "set" as elaborated in legal terms is lacking in the normative materials. In one instance, a set may be an aggregate of preassembled elements for carrying out all jobs on one floor, and in another, for a span, and in a third, for the project as a whole, and so forth. Obviously, the elaboration of the corresponding state standard for the concept of a "set of building materials and structural elements" considering the specific features of the production processes should precede the introduction of the payments.

A similar problem arises also with the direct preparation of the order specifications which determine the set and its price and are the basis for reciprocal payments between the manufacturing (supplying) enterprise and the consumer or contracting organization. It is essential to work out detailed procedural instructions which would clearly define the volume of paperwork and the procedure for carrying it out. Payment for sets of sanitary-technical and other special materials, articles and structural elements must be made analogously to the payment for delivery of sets of preassembled reinforced concrete elements.

Another obstacle is the very payment process. At present, the clearance form of accounts is most widespread. With payments between the supplier and consumer for a product with a short delivery cycle, no difficulties arise but the sets, from the first part to the last, are delivered to the project over longer periods of time. The supplier of sets of prefabricated elements is a participant in construction like any subcontractor. However, a subcontractor, no matter how small the volume of construction, is paid by the general contractor according to a statement of performed work and there can be no question of

employing the clearance method of payment here. It would make complete sense to introduce payments between supplier and consumer following the principle of the payment of the general contractor to the subcontractor, that is, according to statements for the acceptance of completed work. Such a mutually signed statement would be the basis for paying the supplier's bill.

Here commodity transport expenditures will be employed only for payments for motor transport and as a control and accounting unit for accountable officials of the dispatcher and recipient in signing the act of payment for the sets. It is wise to point out that the commodity transport expenditures will be excluded from further turnover for the production sections, bookkeeping and so forth and this will simplify the accounting process. This is very essential since at first glance the introduction of the statements of performed work for delivering the sets increases the amount of accounting work.

Let us examine in more detail the work of industrial enterprises. Will not the introduction of payments for a complete set lead to a decline in the produced product and will this not harm construction ultimately? Such enterprises with a large product range belong, as a rule, to construction organizations, that is, to trusts and glavks. At a majority of these the load factor is uneven, unstable, and is set monthly. The plans for product output are adjusted proceeding from the construction conditions. Monthly planning does not make it possible to establish control over the output of the annually increasing range of products. A payment for sets will upset the planning of the plant load factors in consolidated indicators (the name of the set, its volume and cost). The many hundreds and thousands of product names and units of elements are transformed into scores of sets. But the main thing is that the industrial supplier enterprises will be economically tied to the construction of individual projects. While at present the construction workers place their load orders monthly at the industrial enterprises, payments for a complete set will allow and indeed compel their quarterly introduction. In practice this will lead to a situation where, proceeding from demand, the possibility of the industrial enterprise to produce the product will be precisely considered, and the accuracy and feasibility of the planning will be increased. The possibility of the simultaneous long-term construction of projects by the construction administrations will be reduced since the indicator for the sale of sets would show the financial advisability of the number of projects which can be simultaneously provided with sets for the suppliers.

The introduction of payments for a complete set would qualitatively improve the supply of the projects and, respectively, would increase the effectiveness of construction and installation work. If the possible growth of effectiveness in quantitative terms is measured from the viewpoint of the search for a possible quantitative increase in construction and installation, labor productivity and profit, then this would cause difficulties in line with the lack of sufficiently accurate data for multifactor analysis. A payment for losses from the nonutilization of available material resources would be more accurate. Above-norm inventories of preassembled elements, assembly articles and other materials forming at the construction sites due to their unrhythmical delivery comprise a large amount. This is actually excluded from the circulation of productive capital and impedes the reproduction process.

A reduction in stocks is not an end in itself. With the introduction of payments for complete sets, stocks will reduce and be turned into reserves. For this reason the attempt to reduce them only by administrative means will not produce the desired results. The main thing is the question of improving supply and preassembled delivery for construction by introducing payments for complete sets and thereby increasing the effectiveness of the construction process.

In conclusion we would point out that the resource-savings function of the unit of measurement in price planning is not sufficiently used in the production of thermal energy, the transporting of freight by motor transport and in many other spheres of economic activity, although it merits the closest examination and study.

Thus, we have reached the conclusion that a price based upon a resource-saving unit of measurement has a constant and planned effect on the economic activities of the enterprises and organizations and is accompanied by a savings in the expenditure of past labor by encouraging production to introduce new progressive technologies and organizational procedures, to employ and introduce effective standards and to accelerate the process of the circulation of productive capital.

The Decree of the December (1981) Plenum of the CPSU Central Committee envisages that the necessary measures will be carried out in 1981-1985 to ensure the rational and thrifty expenditure of metal, fuel, electric power, raw products and materials, financial and labor resources.

A further broadening of the use of resource-saving units of measurement in price planning will significantly advance the carrying out of the set task.

10272
CSO: 1820/47

RENEWABLE RESOURCE VALUATION TECHNIQUE SOUGHT

Moscow IZVESTIYA AKADEMII NAUK SSSR-SERIYA EKONOMICHESKAYA in Russian No 6, Nov-Dec 83 pp 47-57

[Article by Yu. V. Ovsiyenko and I. I. Sobolev: "The Economic Assessment of Renewable Natural Resources"]

[Text] The content and interconnections of the system of economic characteristics of the process by which natural resources are exploited are examined from the standpoint of the optimizing approach. They include the economic assessment of resources, reflecting the national economic impact of their consumption; the specific and total expenditures connected with their extraction; reproduction expenditures, etc. A methodological approach is proposed for the economic assessment of renewable natural resources of multipurpose use (as exemplified by timber resources). Problems in quantitative measurement are discussed.

Natural resources are among the most important physical components involved in the process of social production. The efficient functioning of extractive industries depends largely on the quantity and quality of resource reserves. This is a particularly pertinent topic at the present time--the Accountability Report of the CPSU Central Committee to the 26th CPSU Congress stated that "the successes of the entire national economy will depend largely on the more efficient functioning of the extractive industry" [1].

The technical renovation of extractive industries--the introduction of new equipment, the incorporation of progressive technology, etc.--is an important way, although not the only one, of heightening efficiency. The improvement of the economic machinery of resource utilization should play an important role in the attainment of this goal. As N. P. Fedorenko has pointed out, "the entire economic mechanism must be restructured in such a way that each element of this mechanism will have an economic interest in the optimal exploitation of natural wealth" [3]. The economic assessment of natural resources, reflecting their social value, will be an organic part of this process.

The practical value of resource assessment is recorded in the USSR food program approved at the May (1982) CPSU Central Committee Plenum for the period up to 1990. This document stresses that it is now necessary "to also

make use of economic assessments of land, water, material and labor resources in the practice of planning and the evaluation of the performance of economic units" [2].

No unanimous opinions, however, have been expressed in literature dealing specifically with many key aspects of the economic assessment of natural resources. There is no question that this is also reflected in the actual use of resources. The presence of a methodological basis for the economic assessment of various natural resources would promote the quickest possible implementation of the principle of capital returns, which is one of the main economic factors guaranteeing the efficient use of resources. At present, fewer economists are likely to object to the monetary assessment of natural resources; disagreements--primarily of a methodological nature--are rooted in the specific calculation methods proposed. The choice of an approach to the assessment of a particular resource is of primary significance because it will determine its quantitative aspect. Since the principle of capital returns presupposes the inclusion of this expenditure, calculated with the aid of economic assessments, in the overhead costs of sectors using natural resources, the correct assessment level will be particularly important in making valid decisions and, in the final analysis, in securing the efficient use of resources. On the one hand, manufacturing alternatives of national economic benefit could be rejected if comparisons of expenditures and results produce an excessively high assessment. On the other, low economic assessments could lead to the choice of technology distinguished by excessive expenditures of various resources per unit of product and this could ultimately deplete the reserves of some resources.

Therefore, the economic assessment of natural resources is an important parameter, utilized in a cost accounting system to validate decisions on the use of resources. Furthermore, these assessments are more likely to secure the efficient use of resources if they reflect the qualitative and regional characteristics of these resources.

Consequently, the shortage of many types of resources calls for the elaboration of a theory of economic assessment in line with the current objectives of resource utilization. Under these conditions, flaws in methodology and differences in the interpretation of some aspects of methodology have caused many economists to propose specific methods which are too simple and do not reflect important economic factors. By the same token, it is not always correct to choose a method of assessing natural resources by analogy with previous practices because their varying natural properties can require the elaboration of special methods.

Current ideas about the economic assessment of natural resources are discussed in detail in works [4, 5].

In our opinion, the concept of the economic assessment of natural resources is discussed most consistently in the theory of the optimal functioning of the socialist economy. Within the framework of this theory, the system of economic assessments of natural resources represents an organic part of the unified system of interrelated assessments of all productive resources with its own

economic indicators, such as the standard economic impact of capital investments, payments for labor resources, etc.

The optimal assessments derived during the course of optimization processes reflect the national economic value of natural resources more accurately if the very process of the use of resources and the qualitatively characteristics of these resources are described in detail. Therefore, one way of improving the theory of the optimal functioning of the socialist economy would be the continued clarification of specific blocks pertaining to resources in the optimal planning model and the more complete reflection of the distinctive features and properties of natural resources in their economic assessment.

Let us use timber resources as an example to examine some methodological aspects of economic assessment.

All natural resources can be divided into two categories--renewable and non-renewable. This important feature must be taken into account when natural resources are being evaluated and when the technical and economic indicators of their exploitation are being determined. In the case of non-renewable resources, the schedules, sequence and intensity of exploitation must be determined. In the case of renewable resources, the process of their reproduction must be described in the optimization model block along with exploitation processes. By the same token, the optimal intensity of reproduction processes must be taken into account in national economic planning along with the optimal procurement volumes of renewable natural resources.

The limited nature of natural resources,[1] particularly timber resources, is necessitating the intensification of their renewal (in this connection, it would be more accurate to call many renewable natural resources reproducible). The important role played by reproduction expenditures in the process of resource renewal has motivated some authors to propose the use of these expenditures as the economic assessment (see [7]). They assert that the profit estimates derived during optimization processes reflect only the dynamics of the quality differentiation of a particular resource and have no direct connection with the level of reproduction expenditures [7]. In our opinion, this is not necessarily true. We will take a closer look at the determination of the economic value of timber resources with a view to the possibility of their intensive reproduction.

The economic value of a unit of timber[2] (we will measure this unit as 1 cubic meter)--that is, the rise in the value of the optimal criterion accompanying an increase in procurement volumes of timber of this quality per cubic meter--is equivalent to the difference between projected and specific expenditures. And this difference is nothing other than the rental value; in other words, the economic value of timber resources is of a rental nature.

Using the optimization model in which the processes of timber exploitation and reforestation are described, we can show that the economic value of a hectare of standing timber of felling age is the difference between the economic value of proportional timber stocks (determined by the method discussed above) and the cost of reproducing a hectare of timber. Therefore,

the economic value of timber of felling age is the difference between its economic impact and its reproduction costs. This assessment is applicable to areas which will continue to be used for the raising of timber in the future. The economic assessment of an area which will be used for other purposes--for example, for agriculture or construction--will depend on the estimated profits of the trees growing in the area.

Let us assume that the renewal of forests is of an intensive nature--that is, that measures have been taken to prevent the disruption of the biological balance, to lower the felling age, to increase the output of timber per hectare of forested area, to improve the composition of wooded areas and so forth; in other words, measures to expand the possible uses of timber resources.

Reproduction expenditures increase annual timber procurements, and it is obvious that the size of the increase will depend on the size of the expenditures. Therefore, the size of the proportional timber reserve can be viewed as a function of the size of reproduction expenditures. The distinctive features of this function are its constant growth in the presence of larger reproduction expenditures and its consequent sequential nature (corresponding to transitions to qualitatively new reproduction undertakings which would be impossible at a lower level of reproduction expenditures).[3] Research has shown that during these intervals the function is distinguished by a second negative factor--that is, the diminishing impact of additional capital investments.

It is evident that different levels of reproduction expenditures will correspond to different economic assessments of timber resources. The determination of the reproduction level resulting in the maximum economic assessment is of particular interest because it is precisely this set of renewal circumstances that will correspond to the most efficient use of timber resources as a means of production. It can be demonstrated that the economic value of timber reaches its maximum level when the derivation of an additional cubic meter of timber requires an increase in reproduction expenditures equivalent to the difference between projected and specific procurement expenditures--that is, the estimated rental value of a single cubic meter of timber of this quality. Total expenditures on the derivation of this "maximum" cubic meter will be the sum of specific expenditures on procurement and the costs of reproduction, equivalent in this case to the difference between projected and specific expenditures, or total projected expenditures. It is obvious that the continued intensification of the reproduction of timber resources is economically inexpedient because the total cost of deriving an additional cubic meter of timber will exceed total projected expenditures (this is true when the second derivative of the function of timber augmentation from increased reproduction expenditures is negative). Consequently, a further increase in timber consumption must be satisfied with procurement from "projected" areas. This means that the optimal level of the intensification of reproduction is reached when the rental value of the "additional" cubic meter of timber is equivalent to zero.

The economic assessments made according to the method described above have, as has been demonstrated, a rental basis and satisfy the following requirements: Lower specific procurement expenditures will result in the highest resource assessment, all other conditions being equal; in the event of equivalent specific procurement expenditures and proportional timber reserves, the resource with the lowest reproduction cost will be of greater value to society.

The higher the specific procurement expenditures, the lower the permissible level of reproduction costs. In the case of areas where specific expenditures coincide with projected costs, the intensification of reproduction is economically inexpedient, and the rising demand for timber should be satisfied only through the enlargement of felling areas of this category. If this is impossible--that is, if all such reas are already being utilized--the additional demand will have to be covered by felling trees of lower (from the standpoint of exploitation costs) quality. This process should be accompanied by a rise in projected procurement expenditures and this, in turn, should indicate the need for the further intensification of the reproduction of previously exploited forests.

Therefore, the assessments of timber resources derived during the optimization process reflect both the impact of their exploitation (the product of the difference between projected and specific expenditures and the size of proportional reserves) and the cost of their renewal. As demonstrated above, projected expenditures play an important role in determining this cost. The impact of the use of timber or, in other words, its utility, can be reflected when the level of projected expenditures is set. In the optimal plan this is calculated as the social demand for timber.

All of this applies to situations in which timber resources are regarded only as a source of timber for the national economy. At the present time, however, an economic assessment which reflects only the value of timber reserves, even one which takes renewal costs into account, can no longer satisfy the current requirements of economic planning and management. Under the conditions of the growing shortage of natural resources, the need to choose the socially optimal method of exploitation, with a view to comprehensive and multipurpose use, is more likely to arise during the decisionmaking process. Economically sound decisions require methods of assessing the value of various useful attributes of natural resources.

We will begin our analysis of the economic assessment of timber resources with a view to their multipurpose use with an examination of problems in the evaluation of non-timber products, or the useful physical attributes of forests (mushrooms, berries, medicinal herbs, wild game, etc.).

Far from all of these products of forests are now being utilized sufficiently, despite the fact that many of them can be called genuine gifts of nature, requiring virtually no human labor for their production and reproduction and capable of replacing many valuable and, what is particularly important, labor-intensive products of agriculture and other sectors of the national economy.

According to some estimates, industrial procurements of food products from forests represent 10 percent of the possible figure [8]. This fact was recorded in the USSR Food Program for the period up to 1990, which stipulates the need for "the considerable expansion of the gathering and procurement of wild fruit, berries and mushrooms" [2]. The discussion below will demonstrate how the economic assessment of timber resources, reflecting the value of reserve mature trees and non-timber products, can be used in the choice of the optimal system of forest exploitation.

An examination of existing methods of determining the economic value of timber resources quite clearly indicates the need to evaluate all of the physical attributes of forests according to a single procedure. For example, a system of economic calculations in which the value of standing timber is assessed according to payment by the tree, determined by renewal cost, and the impact of the use of non-timber products is assessed with the aid of purchase prices, often indicates that the felling of trees should be ceased and only side products should be procured even in regions distinguished by an acute shortage of lumber. It is obvious that these calculations are of no practical value because they cannot serve as the basis for decisions on the efficient use of all elements of the biological environment of forests.

When the methods of the theory of the optimal functioning of the socialist economy are used, the value of non-timber products can be calculated as the product of the difference between projected[4] and specific expenditures on the procurement of a unit of product and the proportional reserve. Therefore, the current economic value of a wooded area where the standing timber is t years of age is the sum of the current value of the timber reserve, calculated as the impact of the use of timber derived through T-t years (T--felling age) and the current value of various non-timber products.

The capital assesment of this area will be the discounted sum of current assessments. It must be borne in mind that the reserve of many non-timber products will depend to a considerable extent on the age of the standing timber.

The economic value of non-timber products with a view to the expenditures needed to secure the possibility of their continuous procurement is calculated as the difference between the impact of the use of these products (derived with the aid of the method mentioned above) and the cost of preventing ecological damage. This approach, as well as data pertaining to the dependence of the cost of renewing non-timber products on the intensity of exploitation, are presented in work [10]. The intensity of the use of non-timber resources should be established at the level on which their economic value reaches the maximum. Studies have shown that berry procurements have the greatest impact when 50 percent of the biological reserve is exploited [10].

As mentioned above, reserves of many non-timber products depend largely on the age of standing timber; under certain natural and climatic conditions, this parameter could be the deciding factor in the structure of the forest environment. Since the procurement cost of non-timber products depends on proportional reserves, projected expenditures can be used to determine the

nature of the use of forest resources. Procurements of non-timber resources should be made only when the economic value of a unit of wooded area, regarded only as a source of these resources, is not negative.

The current economic value of the entire forest with a normal age structure[5] will be the product of the current assessment of annual timber procurements and estimated non-timber products derived from stands where their economic value is not negative.

The volume of timber procurements and of side products depends largely on the age structure of the forest, and this depends on the felling age. A low felling age will mean a relatively high percentage of young vegetation. This provides for larger procurements of the non-timber products found primarily in young forests (some types of mushrooms, berries, etc.). When the felling age rises, this procurement volume decreases but the exploitation of the non-timber products found in mature forests increases. Therefore, given a certain level of replacement expenditures on the procurement of timber and side products, the economic value of a normal forest can be viewed as the function of the felling age, the intensity of the use of non-timber product reserves, expenditures on timber renewal and expenditures on the reproduction of side product reserves. When we examine this function, we can find conditions which must be satisfied by the optimal values of these parameters. Consequently, this economic assessment of forests can be used as a criterion in the choice of the optimal exploitation patterns.

We previously examined changes in non-timber resource reserves only in connection with a change in the age of standing timber, without taking the influence of other important factors into account. The disclosure of natural tendencies and the dynamics of changes in non-timber product reserves would heighten the accuracy of economic assessments of wooded areas and would consequently enhance the economic validity of decisions regarding the use of forests. One of the first steps which must be taken in this direction would be the study of the interrelations of various physical elements of the forest environment and the determination of their quantitative values. Models presenting quantitative descriptions of the influence of changes in reserves and the quality of some natural resources on the volume and condition of others can also be used to predict the effects of the exploitation of various non-timber products on the state of the forest environment in general.

In our opinion, the achievements of mathematical ecology can be useful in the choice of the optimal system of using the physical attributes of forests. Interesting results of the study of population dynamics within biological communities can be found in the works of the founder of this field of knowledge, Vito Volterra [13]. Several studies of various aspects of the "prey-predator" relationship have appeared recently in special literature [32, 33]. There are also studies in which strategies of minimal depletion have been worked out for various types of renewable resources [34, 35].

Ideally, the choice of an efficient system of forest utilization is a problem requiring the use of optimal administration methods, in which the interaction of various elements of the forest environment is represented by a system of

differential equations, and controlled parameters represent the intensity of the use of various physical attributes of the forest. The capital assessment, calculated as the sum of the capital value of various forest resources, serves as the maximized functional. Future changes in the patterns of forest resource utilization can be predicted with the aid of the dynamics of changes in the relative value of forest resources. This could secure the optimal use of forests with a view to changes in public demand for various forest products.

Another important group of attributes is distinguished by their ability to exert a positive effect on the human environment, or their so-called ecological function. The ecological attributes of natural resources have become much more important now that man's productive activity is having an increasingly negative effect on the environment.

The inefficient use of forests can increase the content of harmful substances in the atmosphere and of silt in rivers, erode the soil and bring about many other negative changes whose prevention requires huge expenditures.

The restriction of environmental pollution and the maintenance of the ecological balance constitute a complex problem whose resolution will require work in many fields of science. It is already impossible to investigate ecological and economic problems in isolation from one another. "At the present time the biosphere with its valuable natural resources is becoming the most important element of the metainfrastructure of national production and consumption and it must be reproduced, just as all other resources (material and non-material) in the national production system" [14].

The allocation of huge sums for environmental protection faces economists with the need to secure the efficient use of nature. In this connection, principles of resource utilization must be determined with a view to the economic impact of changes in the environment and the economic effectiveness of measures to conserve and reproduce natural resources. From the economic standpoint, the ecological functions of natural resources, particularly in forests, can reduce the cost of maintaining the necessary level of environmental quality, expand the possible uses of natural resources and increase the output of various manufactured goods.

Since the ecological and physical attributes of forests are generally transitory--the felling of timber is accompanied by the diminution or even the temporary loss of some of the properties of forested areas--the economic assessment of their ecological functions could be used in the choice of the optimal system of forest utilization. When the total economic value of exploiting the wooded area as a source of timber and its ecological functions are below the economic value of the ecological attributes of the same area in its natural state--that is, without felling--its conversion from an exploited forest to a natural preserve should be considered, or selective felling should be practiced so that the ecological properties of the forest undergo less significant changes. If it is more profitable to procure timber in these forests, the economic value of their ecological properties will be used to determine the optimal system of forest exploitation--that is, a system in which the raw material and ecological attributes are utilized most harmoniously.

The ecological role of forest resources, which we have used as an example in our examination of the process by which multipurpose resources are assessed, is quite significant: They perform water conservation, water regulating and soil protection functions, reduce the physical and chemical pollution of the atmosphere, etc. In our opinion, an analysis of the economic value of the ecological properties of forests should be based on the evaluation of the most important and characteristic ecological functions. The examination of these will provide some idea of the general approach.

From the ecological standpoint, the hydrological role of forests is quite important. This is the basis of their water conservation and water regulating functions.

The water conservation function signifies the ability of forests to exert a positive effect on annual runoff [15]. Some specialists in the field of forest hydrology have questioned the water conservation role of forests by asserting that evaporation is more intensive in forests than in fields. In other words, they believe that forests dry out the soil [16, 17]. Various studies in which the annual runoff of rivers with a high evaporation level has been compared to bodies of water with differing degrees of forestation have not, however, confirmed this opinion [18, 19].

Whereas the water conservation role of forests is still a debatable issue, their water regulating value has not been questioned by anyone. The water regulating function of forested areas signifies their ability to absorb surface runoff and turn it into ground water. The forest not only increases ground water reserves, but also transfers large quantities of water to lower horizons, thereby securing the uniform feeding of rivers throughout the year [20].

The combined effects of the water conservation and water regulating functions of forests expands the possibilities for the use of water as a natural resource. These functions depend on soil and hydrological conditions, the composition of standing timber, its age structure, etc. The water conservation and water regulating functions can be measured quantitatively as the difference between the underground runoff of a forested area and that of an unsheltered body of water.

The economic value of a forested catchment basin is the sum of the estimated timber reserves and the estimated increase in water resources as a result of the presence of forest vegetation. The latter element is the product of this increase in natural terms and the economic value of a unit of water.

If the hydrological effect is viewed as a function of the parameters listed above, the economic value of forests in a catchment basin can be used to determine the optimal system of exploitation. Hydrological properties are manifested most clearly in mature and near-mature forests [21], and a change in the age structure can therefore bring about changes in the water reserve. It is obvious that if the economic value of water resources is high, the forest should consist primarily of mature and near-mature vegetation. This can be ensured by a high felling age. Conversely, when the economic value

of water is low, the maximum use of timber resources should be the main objective. The resources of the "forest-river" system can be used most effectively by controlling the age structure and composition of standing timber.

In addition to the hydrological properties discussed above, another function of great importance from the ecological standpoint is the protection of the atmosphere, which signifies the ability of forests to affect gas-exchange processes in the atmosphere, absorb the solid particles of industrial and household waste (soot, dust, etc.) and accumulate and detoxify various gaseous components.

The effects of the forest's ability to protect the atmosphere are felt in the most diverse spheres. Above all, there is a social impact. Studies have shown that there is a close connection between the state of urban air and the degree of forestation in surrounding territories [22]. By influencing the quality of urban air, the forests thereby help to improve human health and increase longevity, and these constitute one of the most important objectives of socialist development.

In addition to the social impact, the atmospheric protection function of the forests also has an economic impact. This is the reduction of losses of work time for reasons of illness, the augmentation of labor productivity, etc. According to the American Environmental Protection Agency, the economic losses resulting from the rising mortality rate and deterioration of human health in connection with atmospheric pollution total 6 billion dollars a year. The reduction of pollution by half could reduce these losses by 2.08 billion dollars (see [23]).

The reduction of atmospheric pollution could also reduce the financial losses resulting from the accelerated depreciation of structures and corrosion of metals, the reduction of the yield of agricultural crops, the diminution of timber reserves, etc. In the United States these losses have been estimated at 4.9 billion dollars a year [ibid.].

Finally, by absorbing harmful impurities, forested areas replace costly means of purification, saving considerable sums and ultimately affecting the volume and growth rates of industrial production.

Therefore, the atmospheric protection function of forests can be calculated as the volume of harmful impurities absorbed, and its economic value can be measured as the losses prevented as a result of reduced atmospheric pollution and the funds saved on purification installation. Considering the fact that the industrial pollution of the atmosphere reduces the productivity of timber stands [24] and diminishes their atmospheric protection properties [25], the process of optimal planning must include the establishment of the particular level of harmful waste at which the impact of production expansion will compensate for the resulting ecological damage.

When the use and reproduction of forest resources are being modeled, the possibility of managing the atmospheric protection properties of forests must also be taken into account. The gas absorption capacity of various

trees differs widely [26]. The use of pollution dissipation models can, in our opinion, reflect differences in the value of forests, stemming from their location in relation to the source of pollution.

The economic assessment of the recreational functions of forests is of great interest from the methodological standpoint. The process of urbanization, its adverse effect on the human organism and the intensification of labor on the one hand, and the rising educational and cultural level, growth of income and increase in leisure time on the other have all increased the demand for active forms of recreation. To ensure the efficient use of the forest's recreational properties and to determine the quantity and possible uses of resources allocated for the maintenance and reinforcement of these properties, it is necessary not only to calculate the exact losses inflicted on forests by the individuals making use of these recreational properties and the cost of preventing these losses, but also the impact of the use of forests as a recreational site--that is, the economic value of the recreational function.

The economic aspects of forest recreation began to be studied a comparatively short time ago and have not been researched sufficiently as yet. There is the opinion that the specific nature of the "insignificant" forest attributes determining this recreational function makes its economic assessment impossible and invalid [27]. In accordance with other approaches, the recreational properties of forests are supposed to be evaluated according to the impact in the production sphere as a result of the heightened productivity of the labor of workers who have engaged in forest recreation [28], the reduced cost of public health services [29], total expenditures on the cultivation of forests, differential rental values and expenditures on beautification [30].

In our opinion, these methodological disagreements with regard to the economic assessment of the recreational function of forests stem from an incorrect understanding of its effect on the human being. There is no question that recreation in forests has a favorable effect on human health, resulting in higher labor productivity, reduced public health expenditures and so forth, but all of these are only side effects and do not constitute the principal motive for the expenditure of funds and the leisure time of individuals.

Many different spiritual and physical demands are satisfied directly during the process of forest recreation: The forest is of great aesthetic significance, it alleviates tension, compensates for physical inactivity and gives people a comforting sense of seclusion and spatial freedom [31]. Therefore, the recreational "services" of the forest represent a unique "consumer item." This similarity is reinforced by such features as the individual's freedom to choose the location and duration of his recreation (within the framework of his leisure time) and the need to spend time and money on this recreation. We feel that this specific nature of the recreational function of forests presupposes the need to be guided by the commercial features of the forests, from the standpoint of the quality of the recreation it offers, when it is being assessed.

We have examined the most significant features of natural resources which must be taken into account in their economic assessment. The disclosure and

clarification of the specific properties of various natural resources and their reflection in optimization models could contribute to a more thorough understanding of the essence of an important economic category--the value of natural resources--and the more precise quantitative measurement of these resources. In the final analysis, this turns this kind of assessment into an effective instrument of efficient socialist resource utilization.

FOOTNOTES

1. Discussions of the limited nature of natural resources refer to their economic limitations, consisting "not in the physical absence of a raw material, but in the expenditures needed for its efficient use" [6].

2. This presupposes that a timber reserve of a specific quality, viewed from the standpoint of procurement expenditures, which depend on the nature of its exploitation and transport, is limited and that its value is therefore positive.

3. This presupposes that the funds allocated for the reproduction of forest resources are used as effectively as possible--that is, measures to secure the maximum growth of the timber reserve are chosen in line with the given level of reproduction costs.

4. For example, projected expenditures on the procurement of various berries in Kalinin Oblast are calculated in [9].

5. In the case of a normal age structure (or a normal forest), standing timber of all ages (within the limits of the felling cycle) cover equal areas of land (for more detail, see [11, 12]).

6. Data on the differing hydrological properties of various trees can be found, for example, in work [36].

BIBLIOGRAPHY

1. "Materialy XXVI s"yezda KPSS" [Materials of the 26th CPSU Congress], Moscow, Politizdat, 1981, p 41.

2. "Food Program of the USSR for the Period up to 1990 and the Means of its Implementation," "Materialy mayskogo Plenuma TsK KPSS 1982 g." [Materials of the May 1982 CPSU Central Committee Plenum], Moscow, Politizdat, 1982, pp 39, 60.

3. Fedorenko, N. P., "Ekonomicheskiye problemy optimizatsii prirodopol'zovaniya" [Economic Aspects of the Optimization of Resource Utilization], Moscow, Nauka, 1973, p 14.

4. Sukhotin, Yu. V., "The Assessment of Natural Resources," VOPROSI EKONOMIKI, 1967, No 12.

5. Suspitsyn, S.A., "Correlative Approaches to the Economic Assessment of Natural Resources," in the book: "Prirodnyye resursy v modelyakh territorial'no-proizvodstvennykh sistem" [Natural Resources in Models of Territorial-Production Systems], Novosibirsk, Nauka, 1982.

6. Lifshchits, R., "Connection Between the Extractive and Processing Industries," VOPROSY EKONOMIKI, 1973, No 11, p 15.

7. Shalabin, G. V. and Pakhomova, N. V., "On the Economic Assessment of Forest Resources (Questions of Theory)," in the book: "Primeneniye matematiki v ekonomike" [The Use of Mathematics in Economics], Leningrad, Izd-vo LGU, 1975, No 10.

8. Teleshevskiy, D. A., "Sokrovishcha lesa. Kompleksnoye ispol'zovaniye nedrevesnoy produktsii lesa" [Forest Treasure. The Comprehensive Use of Non-Timber Products], Lvov, Visha shkola, 1974.

9. Yel'chev, N. M., "On the Economic Value of Forest Food Resources," LESNOYE KHOZYAYSTVO, 1982, No 2.

10. Sen'ko, Ye. I., "The Dependence of the Impact of Wild Berry Resource Exploitation on the State of their Reproduction and Protection," LESNOY ZHURNAL, 1982, No 4.

11. Moiseyev, N. A., "Osnovy prognozirovaniya ispol'zovaniya i vosproizvodstva lesnykh resursov" [The Fundamentals of Forecasting the Use and Reproduction of Forest Resources], Moscow, Lesnaya prom-st', 1974.

12. "Raschet razmera lesopol'zovaniya" [Calculation of Degrees of Forest Utilization], Moscow, Lesnaya prom-st', 1973.

13. Volterra, V., "The Mathematical Theory of the Struggle for Existence," Moscow, Nauka, 1976.

14. Bagrinovskiy, K. A. and Lemeshev, M. Ya., "On the Planning of Economic Development with a View to Ecological Requirements," EKONOMIKA I MATEMATICHESKIYE METODY, 1976, Vol XII, No 4, p 684.

15. Idzon, P. F. et al, "The Quantitative Features of the Water Conservation and Water Regulating Properties of Forests," LESOVEDENIYE, 1980, No 5.

16. L'vovich, M. I., "Chelovek i voda. Preobrazovaniye vodnogo balansa i rechnogo stoka" [Man and the Water. Conversion of the Water Supply and River Runoff], Moscow, Geografgiz, 1963.

17. Shpak, I. S., "Vliyaniye lesa na vodnyy balans vodosborov" [The Effects of Forests on the Water Balance of Catchments], Kiev, Nauk. dumka, 1968.

18. Idzon, P. F. and Pimenova, G. S., "Vliyaniye lesa na stok rek" [The Effects of Forests on River Runoff], Moscow, Nauka, 1975.

19. Rakhmanov, V. V., "The Role of Forests in the Formation of River Runoff," LESOVEDENIYE, 1978, No 7.

20. Pobedinskiy, A. V., "The Use and Protection of the Environment," LESNOYE KHOZYAYSTVO, 1981, No 8.

21. Chubatyy, A. V., "The Effects of Forests and Felling on the Water Balance of Catchments (As Exemplified by the Carpatians)," LESOVEDENIYE, 1980, No 2.

22. Smirnov, I. I., "The Use of Multiple Regressive Analysis in the Determination of the Quantitative Hygienic Effect of Forest Vegetation," in the book: "Optimizatsiya ispol'zovaniya i vosproizvodstva lesov SSSR" [The Optimization of the Use and Reproduction of Forests in the USSR], Moscow, Nauka, 1977.

23. Nikitin, D. P., "Nauchno-tekhnicheskiy progress i chelovek" [Scientific and Technical Progress and the Human Being], Moscow, Nauka, 1977.

24. Balataskiy, O. F. et al, "The Assessment of Losses in the Timber Industry from Atmospheric Pollution," LESNOYE KHOZYAYSTVO, 1979, No 1.

25. Turkevich, I. V. and Voblaya, I. S., "The Economic Assessments of Losses Resulting from the Environmental Protection Function of Forests Due to Industrial Pollutants," in the book: "Metody planirovaniya i upravleniya prirodnymi resursami (planirovaniye i upravleniye kachestvom okruzhayushchey sredy)" [Methods of Planning and Managing Natural Resources (or Planning and Managing Environmental Qaulity)], Moscow, Central Economics and Mathematics Institute, USSR Academy of Sciences, 1979.

26. Smirnov, I. I., "Okhrana biosfery i lesnaya rastitel'nost'" [The Protection of the Biosphere and Forest Vegetation], Moscow, Lesnaya prom-st', 1977, pp 52-80.

27. Pis'mennyy, N. R., "An Inquiry Into the Economic Aspects of the 'Non-Material' Natural Resources of the Forest," LESNOYE KHOZYAYSTVO, 1979, No 10.

28. Il'yev, L. I. and Gordiyenko, V. N., "The Economic Value of the Forests of the Green Zone," LESNOY ZHURNAL, 1973, No 3.

29. Petsev, Ye. V., "The Economic Assessment of the Social Functions of Forests," LESNOYE KHOZYAYSTVO, 1978, No 10.

30. Antsukevich, O. N., "The Procedure for the Economic Evaluation of the Recreational Functions of Forests," LESNOYE KHOZYAYSTVO, 1978, No 5.

31. Tarasov, A. I., "Ekonomika rekreatsionnogo lesopol'zovaniya" [The Economic Aspects of the Recreational Use of Forests], Moscow, Nauka, 1980, p 10.

32. Legovich, T. and Rinaldi, S., "Periodic Harvesting Strategies for Predator-Prey Systems: A Special Case," ECOLOGICAL MODELING, 1981, Vol 14, Nos 3-4.

33. Beddington, I. R., "Harvesting from a Prey-Predator Complex," ibid.

34. Plourden, C., "Diagrammatic Representation of the Exploitation of Replenishable Natural Resources: Dynamic Iterations," JOURNAL OF ENVIRONMENTAL ECONOMICS AND MANAGEMENT, 1979, Vol 6, No 2.

35. Simaan, M. and Takayama, T., "Optimal Harvesting Policies and Regulations for Renewable Resources," INTERNATIONAL JOURNAL OF SYSTEMS SCIENCE, 1980, Vol 11, No 3.

36. Dyer, T., "On Technique To Investigate the Correlation Between Streamflow and Rainfall in Afforested Catchments," ECOLOGICAL MODELING, 1981, Vol 13, No 3.

8588
CSO: 1820/35

CONSERVATION OF MATERIALS -- KEY TO LOWER COSTS

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 11, Nov 83 pp 60-67

[Article by A. Sekerzhitskiy, department chief, BSSR Gosplan: "Economizing of Material Resources Is the Decisive Factor in Cost Reduction"]

[Text] Production cost is a very important qualitative indicator that reflects both the successes and the shortcomings of the economic-production activity of enterprises. It characterizes the level of organization of production and labor, the efficiency of the use of the production assets and working capital, as well as the expenditures linked with the failure to observe the deadlines for delivery of the output to the customer, etc. Therefore, the planning, accounting, and analysis of production cost must be given the most serious attention.

A considerable share in the production cost of industrial output is represented by material expenditures. For the industry of BSSR, they constituted, in 1981, 77.9 percent; in 1982 (in prices effective 1 January 1982), 78.6 percent; and for the industry of the union-republic ministries and departments, even more (in 1982 that indicator was equal to 88.6 percent). It is completely obvious that the economizing of material expenditures predetermines also the reduction of the production cost as a whole.

A careful attitude toward the expenditure of all types of resources is a task of nationwide importance. Its vital importance is influenced by the progressive growth of the need for raw and other materials, fuel, and energy, by the limited nature and the irreplaceability of the reserves of many minerals, and by the complication of the conditions of their production and their transportation to the places of consumption.

The reduction of the material expenditures for the production of output, the strictest economy measures and thrift, remain very important conditions for the development of the national economy, and for the raising of the national standard of living. General Secretary of the CPSU Central Committee Yu. V. Andropov, at the November 1982 Plenum of the CPSU Central Committee, pointed out, "I would like to direct the comrades' attention to the fact that at the present time the question of the economizing of material resources must be considered in a new manner, and not with the attitude 'if you have

economized, that's good, but if you haven't economized, that will be all right too'. . . At the present time economizing, a thrifty attitude toward the people's wealth, is a question of the feasibility of our plans"*.

Attaching special importance to the economizing of material resources, the CPSU Central Committee and the USSR Council of Ministers adopted a special decree entitled "The Intensification of the Work to Assure the Economizing and Efficient Use of Raw-Material, Fuel-and-Energy, and Other Material Resources," which stipulated a series of measures aimed at that. The most important ones are: the introduction of resource-saving technology, and of technological processes with little or no waste products; the improvement of planning, the providing of economic incentives, and accounting. A special role is assigned to science. In conformity with the decree, interdepartmental commissions on economizing and the efficient use of material resources have been created, and other measures are being carried out.

Purposeful work involving the use of local types of raw materials and production waste products is being carried out by BSSR Minmestprom. Most of the enterprises in that ministry have created shops and sectors for the processing of various types of local raw materials and waste products. The following organizations have been created for the purpose of producing consumer goods from local types of raw materials: the Belkhudozhkeramika Production Association (lead enterprise, the Radoshkovichi Art Ceramic Plant); the Svisloch Factory for the production of furniture from vines; and the Domanovskiy Glass Plant for the production of glass jars for the packing of household-chemistry commodities.

During 1982 enterprises in local industry in BSSR used production waste products to manufacture output valued at a total of 43.1 million rubles (33.2 percent more than in 1980), and used local types of raw materials to manufacture output valued at 54.6 million rubles (22 percent more). Metal waste products -- 7305 tons of which were reprocessed -- were used in 1982 to produce more than 200 different kinds of articles. Moreover, half of those waste products were supplied by enterprises that were not part of the system of local industry. In order to improve their shipment and processing, six base enterprises were established in the branch, and special transportation was assigned to them.

Wood waste products are used to manufacture various consumer goods (more than 155 different types of articles), for which more than 60,000 cubic meters of waste products are used each year. In light industry, waste products were used for the production of half-wool yarn, which was then used to produce blankets, bedspreads, furniture throws, and runners; and in the garment industry to manufacture children's clothing. At enterprises in the ministry, waste products of the chemical industry have also found broad application. During the years of the 11th Five-Year Plan, it is planned to increase in local industry the production of output from waste products and local raw materials by a factor of at least 1.5 and to increase the volume of their production in 1985 to 111 million rubles. This will allow a more than 1.5 million ruble decrease in material expenditures as compared with 1983.

---

* "Materialy Plenuma Tsentral'nogo Komiteta KPSS 22 novabrya 1982" [Materials of the 22 November 1982 Plenum of the CPSU Central Committee], Moscow, Politizdat, 1982, pp10-11.

Considerable success in the economical expenditure of raw materials and the reduction of production waste products and their maximum use was achieved by the Bobruysk Leather Combine imeni 60-letiye Velikogo Oktyabrya. That combine developed a comprehensive plans of measures which was aimed at the successful fulfillment of the tasks specified by the decree that was previously mentioned. The increase in the resources of leather commodities for the shoe industry was achieved here as a result of the reduction of the specific norms for the expenditure of raw materials per unit of finished hides, the raising of the quality level of those hides, the better use of raw materials with regard to thickness, the reduction of waste products, and their repeated application.

All this made it possible as early as 1981 to reduce the material expenditures by a total of 391,400 rubles, including a saving of approximately 390 tons of leather raw materials, 80 tons of table salt, 21 tons of synthetic tanning agents, and 32 tons of fats. Of the waste products obtained at the combine (more than 6,800 tons), 76 percent is used in the consumer goods shop for the production of hide glue, industrial grease, buttons, etc. In 1981 the consumer goods shop obtained 220,000 rubles of profit from the sale of its output.

The reprocessing of production waste products is well organized at the Bobruyskdrev Association (which includes, in addition to the lead enterprise -- the Bobruysk Plywood and Wood-Processing Combine -- four furniture factories and two timber managements). The creation of the association made it possible to carry out the specialization and concentration of production, the technical re-equipping of the enterprises, to outfit them with highly productive automatic and semiautomatic lines, and to employ new, highly effective materials in the production of furniture.

At that association, materials which are scarce are successfully replaced by those that are less scarce: lumber from coniferous species, by lumber from soft-deciduous species; planed veneer, by synthetic veneer; etc. The wood from soft deciduous species has been used to organize the production of sets of packing boxes; that made it possible in 1982 to utilize approximately 15,000 cubic meters of previously unused wood.

The employment of waste products as secondary raw materials has been growing from year to year. In 1971 -- during the period of the creation of the association -- approximately 140,000 cubic meters of waste products were utilized, and the coefficient of the complete consumption of wood at that time was 0.82. In 1981 approximately 180,000 cubic meters of waste products were involved in production, and that increased the coefficient to 0.86. During the current year a new plant with a capacity of 15 million square meters of wood-fiber panels will become operational; it will process as much as 30,000 cubic meters of felled-timber waste products. As a result, by the end of the current five-year plan the coefficient will rise by an additional 3 percent.

Positive examples of the efficient use of waste products also exist at other enterprises. In the production of articles made of glass, approximately 80 percent of the broken glass and defective glass products are returned for

reprocessing for the purpose of manufacturing glass jars, glass slabs, and decorative facing panels. At the Osipovichi Cardboard and Rubberoid Plant, more than 60,000 tons of paper and textile waste are used for the manufacture of high-grade roofing materials.

A definite amount of work is being done to improve the organization of the restoration of worn-out parts of motor vehicles, tractors, and agricultural machinery. Thirty-eight mechanized-flow lines are currently in operation at repair enterprises. In 1982, enterprises of BSSR Goskomsel'khoztekhnika restored worn-out parts with a total value of 38.3 million rubles. The result has been a conventional saving of more than 68,000 tons of rolled metal. As a result, the economizing for the purchase of new spare parts came to approximately 12 million rubles.

A considerable benefit in the saving of material resources and the lowering of production costs is provided by the joint work performed by the ministries, associations, and enterprises with scientific-research and planning-and-designing organizations. The Technological-Design and Construction-Planning Institute of the Ministry of Local Industry, jointly with the Belorussian NPO [Scientific-Production Association] for Powder Metallurgy, developed and is carrying out a scientific-technical program for the introduction of the production of parts manufactured by the powder-metallurgy method. The economic benefit from the introduction of this measure will constitute approximately 250,000 rubles a year. The Slutsk Metal-Processing Production Association of that ministry, jointly with the Physical-Engineering Institute of the BSSR Academy of Sciences, is introducing into production the technological process of the shaping of harrow teeth by the method of transverse-wedge rolling (proposed saving, 230,000 rubles a year).

On the basis of projects developed by the Scientific-Research and Technological-Design Institute of the Casting Production of the Automobile Industry, the Lida Motor-Vehicle Repair Plant of BSSR Goskomsel'khoztekhnika has employed a technological process of casting the cylinder cases for motor-vehicle motors on a model 4912A casting machine. The new process for casting cases makes it possible to reduce the allowance for processing to 1.5-2 mm, and to increase the coefficient of use of metal by a factor of 1.5. In 1984 it is planned to introduce at that plant a technological robot complex that was developed and is being manufactured by that institute. The complex consists of three machines that will make it possible to satisfy completely the republic's needs for those cases (economic benefit, more than one million rubles a year).

The plan for the economic and social development of the USSR in 1983 stipulates new indicators: assignments for the production costs of output, and, as part of them, a limit (maximum level) for the material expenditures in monetary terms per ruble of commercial output (operations). When the draft versions of the plans were being developed and they were being approved, the material expenditures per ruble of commercial output figured in the computations even earlier (at the level of the republic's ministries and departments). However, the proper attention has recently not been devoted to that indicator, or to production costs as a whole. They have not been approved. Frequently the enterprises that fulfilled the plan with regard to

the quantitative indicators have been considered to be advanced enterprises even if they have failed to fulfill the assignments with regard to the production costs. Although that indicator was made known to the enterprises in computed terms and the statistical reports on that indicator existed, the proper attention was not devoted to the failure to fulfill the assignment for it.

The planning of material expenditures per ruble of commercial output has as its goal the more effective and more economical use of the material resources in production, the guaranteeing of the outstripping rates of its growth as compared with the expenditures on the basis of the improvement of the technology, the technological processes, and the organization of production, its structure and placement, as well as the reduction of waste products and losses, and the more complete use of the secondary resources and by-products.

The practice of the application of the limit of material expenditures per ruble of commercial output in industry has shown that the situation is not developing favorably everywhere in this regard. For individual ministries and departments a considerable amount of the material expenditures occurred in the item "Other expenses" and when, in conformity with the new instructions for the planning and accounting of productioncosts, it was precisely established which expenditures should be taken from "other expenses" and put into material expenditures, it turned out that the actual level of the latter was considerably higher than the level that had been stipulated by the plan. As a result, for certain ministries, despite the overall fulfillment of the plan for the lowering of production costs as a whole, there had been an overexpenditure with regard to material expenditures.

In conformity with the new instructions for the preparation of current reports, when evaluating the fulfillment of the plan for the production costs and the material expenditures, one must exclude the saving derived from the nonfulfillment by the enterprises to develop and improve production, measures to protect the environment, the violation of the rules for the use of natural resources, or the production of output in proportions that do not conform to the planned output (change in the products list and variety of output as compared with the plan). Additional instructions with regard to the saving that is not to be taken into consideration when evaluating the fulfillment of the plan for production costs have been provided for the food and light industry.

The new forms for the reporting on production costs reflect, thus, the nonfulfullment of the plan both with regard to the planned products list, and with regard to the development and improvement of production, since the saving that is caused by the factors that have been indicated is not taken into consideration in the overall saving that results for production costs and material expenditures. As a result, instead of the saving derived by the old method of computation for production costs as a whole and for material expenditures, after the deduction of the saving that is not taken into consideration when evaluating the plan fulfillment, there can be an overexpenditure. Therefore it becomes necessary to take effective steps aimed at improving the use of the material, labor, and financial resources, the fulfillment of the established products list and the variety of output. For example, at BSSR Minmestprom, on the basis of the report for the first quarter of 1983,

the saving computed for production costs was only 0.2 million rubles, whereas by the old method of reporting it had been determined in an amount of 2.3 million rubles (the saving that is not to be taken into consideration when evaluating the fulfillment of the assignment for production costs as a result of a change in the variety of the output being produced had been excluded). On the basis of the results of the work in the first quarter, the ministry issued a special order, entitled "The Reduction of Production Costs and Ways to Eliminate the Unprofitability of the Output in the System of BSSR Minmestprom," in which there was an indication of all the associations and enterprises that had failed to fulfill the plan for the reduction of production costs as a whole, and also for material expenditures, and specific measures for improving the work were defined.

The introduction of computations that are linked with the ascertaining and exclusion from the obtained results of the activities of the associations and enterprises of that saving which is not to be taken into consideration when evaluating the fulfillment of the assignment for production costs, and also for material expenditures, required additional work when preparing reports on Form No. I-s and the Appendix to Form I-s (quarterly). But those computations are supposed to play an important role in the reduction of material expenditures and production costs as a whole. It would be desirable if the methodology of determining the production costs and material expenditures to be included in the reports on production costs were somewhat simplified, and if the instructional guide were more understandable, but if the requirements for the reflecting in the production costs of the actual saving that is to be taken into consideration when evaluating the plan fulfillment were retained.

The establishment of a limit for material expenditures, and the inclusion of the fulfillment of the established limit for the expenditure of materials in the terms for the computation of the economic-incentive funds, had a desirable influence upon the locating and the use of reserves. Many associations and enterprises carried out, in the first half of 1983, organizational and technical measures that were aimed at the reduction of material expenditures. For example, at BSSR Minpishcheprom, for the Borisovmakaronprom, Minskkonditerprom, and Zhabinka Sugar Plant alone, the savings resulting from the reduction of losses and the increase in the output of production in the first half of 1983 came to 0.8 tons of flour, 4 tons of groats, 47.4 tons of confectionery sugar (in terms of dry substance), and 956 tons of sugar beets, with a total value of 163,000 rubles.

At the Vileyka Repair Plant of BSSR Goskomsel'khoztekhnia, the use of less expensive materials for the manufacture of railroad cars used as homes led to a reduction of material expenditures by 3.9 kopecks per ruble of output and saved 120,000 rubles in 1983. At the Orsha Tractor-Repair Plant, by means of the use of rebuilt parts instead of new ones, there was a saving of 85,000 rubles. A large number of similar exchanges exists at other ministries and departments. As a result of the work that has been done to save material resources, during the first half of 1983 the above-plan reduction of material expenditures (after the deduction of the saving that is not taken into consideration when evaluating the fulfillment of the assignment for material expenditures) constituted, for the republic's industry, 0.56 percent, including

0.84 for industry of union subordination and 0.3 percent for industry subordinated to the BSSR Council of Ministers; and the saving of material expenditures with regard to the entire saving in production costs was 80.9 percent.

An important role in the economical expenditure of material, fuel-and-energy, and other resources must be played by the introduction of the normative method of taking into consideration the expenditures for the production and the estimating of the production costs on the basis of progressive norms and norm lists in those branches of industry when that method has not yet been introduced. This method contributes to the intensification of accounting in the struggle to increase the effectiveness of the work performed by the enterprise. It makes it possible to detect promptly or to prevent the deviations in technological processes that occur in the process of production, and the failures to assure the proper material-technical supply or the proper organization of production, and to establish effective control over the use of material, labor, and monetary resources in production, and also exerts a positive influence upon the introduction of effective intraplant cost accountability.

At associations and enterprises of union-republic and republic ministries and departments, the normative method of accounting of expenditures for production and the estimating of production costs has not been used in full volume until the present time. It is only since 1983 that the first steps in this direction were taken by the BSSR Ministry of Local Industry, BSSR Minpishcheprom, BSSR Minstroymaterialov, etc. More considerable work was carried out by BSSR Minlegprom, where two plans have been developed and are being carried out: a plan for the introduction of the normative method of accounting for expenditures for production and the estimating of the production costs; and a plan for additional measures to increase the monitoring of the guaranteeing of the reliability of the report data.

The principal merit of the normative method lies in the fact that the expenditures for production are accounted for on the basis of current norms during the period of the carrying out of the production operations, and all the deviations from them are formalized prior to the beginning of, or at the moment of completion of, the operations by the use of special forms for reporting deviations and giving notifications. A mandatory condition for its application is the preliminary working out of the normative estimates on the basis of progressive norms for the expenditure of raw and other materials and wages.

BSSR Gosplan, jointly with BSSR Gossnab, approved the procedure for the elaboration and coordination of the norms for the expenditure of raw-material, fuel-and-energy, and other material resources at associations, enterprises, and organizations of the republic's ministries and departments. The lead organization that is in charge of the creation of the system of progressive norms and norm lists as a whole is the Belorussian Scientific-Research Administration, under BSSR Gosplan. A large amount of attention is being devoted to the improvement of the establishment of norms for the expenditure of raw and other materials, for the purpose of reducing the norms, at enterprises of BSSR Minmestprom, BSSR Goskomsel'khoztekhnika, etc.

The basic directions in the work of saving material and fuel-and-energy resources at BSSR Minmestprom in the current five-year plan and during the period until 1990 is the use of rolled metal of improved quality and economical shapes; the improvement of the structural elements used in the articles; the reduction of the tolerances for mechanical processing; the use of production waste products instead of valuable metal; etc. The carrying out of the technical-organizational measures that have been developed should provide in 1981-1985 a saving of 18 percent in the expenditure of rolled ferrous metals.

The assignment for the reduction of the expenditure norms for raw and other materials for that ministry in 1982 was fulfilled in the complete volume, and as a result there was a saving, as compared with 1981, of 3037 tons of rolled ferrous metals and 4.6 tons of rolled aluminum. There was a slight overfulfillment of the assignment for the saving of zinc, cast iron, and lumber. In addition, considerable amounts of other types of materials were also saved: 49.6 tons of polyethylene, 20 tons of sulfuric acid, 21 tons of calcined soda, 27 tons of paper output, 6322 tons of standard fuel, 40,133 gigacalories of thermal energy and 2,029,000 kilowatt-hours of electrical energy.

BSSR Minlegprom has systematized the procedure for supervising the establishment of norms for the expenditure of raw and other materials per unit of output. In 1981-1983, for the textile, knitwear, garment, and shoe enterprises, there was a reconsideration of approximately 9000 group norms for the expenditure of raw and other materials, with an economic benefit of approximately 10 million rubles. As compared with the approved norms, during the first 2½ years of the 11th Five-Year Plan, the total amount of saving of all types of technological raw materials that was obtained in production amounted, in wholesale prices, to 22 million rubles, including 15.6 million rubles as a result of the introduction of measures. In physical terms, the saving, as compared with the norms in effect, came to: 1258 tons of fibers of all types, 998 tons of yarn and thread, 523,000 square meters of fabrics, 136.6 million square decimeters of shce-making materials, and 3,400 tons of hides.

The branches are constantly introducing new resource-saving technological processes that have been converting the enterprises into production entities that produce little or no waste products. For the republic's leather plants as a whole, the use of waste products constitutes 90.8 percent. Subbranches of industry which have become production entities with little or no waste products are such subbranches as cotton-fabrics (100 percent), linen (100 percent), and wool (99.6 percent). Half the waste products at the Zhlobin Artificial Fur Factory is reused for the production of fur, and weighable scraps are completely processed at the consumer goods shop for the production of blades and sleeves for paint rollers.

A number of measures have been provided for the purpose of improving the creation of material incentives for the economizing of material resources. First of all, progressive norms have been established for the expenditure of specific types of material resources, the accounting for the expenditure of which is reliable, that is, is carried out with the aid of monitoring and measurement instruments or by other reliable methods. The saving of specific

types of material resources is determined on the basis of the results of the report period (quarter, month) as compared with the technically substantiated (average-progressive) expenditure norms that have been approved by the established procedure. The total saving resulting in the report period is supposed to be reduced by the amount of overexpenditure that had been allowed to occur during the previous period of the calendar year for the same materials, but by no more than 50 percent. Bonuses for the saving of specific types of material resources are paid to the workers in excess of the maximum size of the bonuses established for the branches, and to ITR [engineer-technical workers], in excess of the maximum size of the bonuses for the basic results of economic activity.

A factor that can have substantial importance in the economical and thrifty expenditure of material resources is the further development and improvement of intraproduction cost accountability, which creates the prerequisites for the successful fulfillment of all the plan indicators with the least expenditures of labor, material, and monetary means. It includes the system of measures for the providing of economic incentives to production and for the increasing of the workers' collective and personal self-interestedness in the results of their labor.

The development of intraplant cost accountability presupposes the informing of the divisions and sectors of the cost-accountability indicators, which include elements of production costs. The planning of the expenditures for those subdivisions (other than wages, which, as a rule, are planned always), the maintaining of records, and the providing of incentives for their economic activity exert a desirable influence upon the economizing of material resources in the particular sector, and, consequently, in the shop and at the enterprise as a whole. It is necessary to make the planned indicators known and to maintain reports on the expenditure of material resources also at enterprises with a nonshop structure.

Great opportunities for the introduction of low-level cost accountability are opened up by the brigade system of organizing labor. Positive examples of this exist at the Minskiy Traktornyy Zavod im. V. I. Lenina PO [production association], where large-scale brigades that encompass a sector or a shift have been created. They are informed of the assignments for production costs, which previously had been informed to the sectors: production costs -- total, including wages, basic materials, auxiliary materials, expenditure of cutting tools, purchased semifinished goods, and losses from defective output during production adjustment.

Of course, the introduction of intrashop and especially brigade cost accountability is linked with additional expenditures of labor for planning and chiefly for accounting for the actual expenditure of the raw materials, the basic and auxiliary materials, the cutting tools, and the losses for adjustment. In addition, it is necessary to have various measurement instruments, and this involves additional expenditures. However, they pay for themselves by the additional saving from the reduction of material expenditures, which saving will be obtained if the persons who take an economical and thrift attitude toward the expenditure of all the consumed resources include all the

members of the collective in that subdivision (sector, brigade) and especially if they have a material self-interestedness in that. The introduction of effective intrashop cost accountability is considerably facilitated by the existence at many large-scale enterprises of automated systems of production control.

The definite amount of work that is being done at enterprises of republic and nonindustrial union-republic ministries and departments with regard to the saving of material, labor, and financial resources guarantees the regular reduction of production costs. The republic's industry as a whole has coped with the assignment of reducing production costs, including material expenditures, during the first seven months of 1983. However, in addition to positive factors, there have been shortcomings and unresolved problems in the work of saving material resources. Despite the considerable amount of work to reduce the norms for expenditure of metal for the production of output, the coefficient of its use at individual machine-building and metal-processing enterprises remains low. Metal waste products are not being reduced and are being poorly used for the production of output.

During 1981, 500,000 tons of metal waste products in the form of pieces were formed at enterprises in the republic. According to computations made by specialists, approximately 30 percent of that amount (150,000 tons) could be used without being resmelted for the manufacture of consumer goods and articles intended for production purposes. But only 45,000 tons were actually used. That is obviously insufficient (and the total included 7,700 tons for the production of consumer goods, as compared with 9000 in 1980). In 1981, additional output valued at more than 11 million rubles was produced from those waste products.

During 1982 the republic's ministries and departments failed to fulfill the assignments for the reduction of the expenditure norms for rolled ferrous metals, rolled brass, and thermal energy. There was a lessening of supervision over the rate of fulfillment of the assignments for the economizing of materials at enterprises of the unionwide and union-republic ministries, that is, the assignments for the republic's basic consumers of raw and other materials, fuel, and energy. A large amount of valuable waste products from production that are completely usable are being taken out to the dump heap.

Speaking at the 12th Plenum of the Central Committee of the Communist Party of Belorussia, First Secretary of the BCP Central Committee N. N. Slyun'kov remarked that the associations and enterprises have been insufficiently aggressive in carrying out measures to save energy and materials, and that for the past ten years the waste metal products in machine-building and metal-processing have not been decreasing and constitute approximately 24 percent, with the coefficient of use of metal at many plants being equal to 0.5-0.65, while at the enterprises in Minsk it dropped from 0.71 in 1976 to 0.69. He pointed out that, in the area of the economy and production, the republic's workers have been faced with an exceptionally important, large-scale dual task -- the guaranteeing, within the immediate future, of the entire increase in the volumes of industrial production simply as a result of the increase in labor productivity and practically without the increase in material resources*.

---

* See: SOVETSKAYA BELORUSSIYA, 11 March 1983.

The fulfillment of the tasks that have been posed by the 26th CPSU Congress and the November 1982 and June 1983 Plenums of the CPSU Central Committee with regard to the economizing of material, financial, and labor resources, will guarantee the further reduction in production costs and the considerable increase in the effectiveness of social production.

5075
CSO: 1820/32

KACHATUROV'S BOOK ON NATURAL RESOURCES UTILIZATION REVIEWED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 11, Nov 83 pp 120-121

[Article by P. Poletayev, candidate of economic sciences: "Questions of Rational Nature Management"; review of book by T. S. Kachaturov, "Economics of Nature Management", "Ekonomika", 1982, 256 pp]

[Text] With the growth in the scales of production and demands for natural resources, questions concerning the interrelationship between society and nature are attracting ever greater attention from scientists of the most varied schools. Regardless of the great number of monographs and articles devoted to one or another aspects of the problem of the rational use and preservation of natural resources, the economic side of the problem has as yet been poorly investigated and insufficiently elucidated in the literature. Therefore, T. S. Khachaturov's presentation in his book of results of research on the economic aspects of nature management are important and useful.

A distinguishing feature of the monograph is that it touches a whole complex of questions related to the economic side of the problem of nature management. Both the theoretical questions of nature management as well as an analysis of practical questions of the rational use and preservation of natural resources are presented, examined from an economic point of view.

The book examines the interrelationship between the growth in production and rational nature management. Data is presented which attests to the fact that with a growth in production, the economic use of natural resources becomes particularly important. The critical analysis of bourgeois theories of growth cessation or reduction in production volumes in conjunction with the exhaustion of natural resources in developed capitalist countries appears logical. On the basis of this analysis, T. S. Khachaturov is completely justified in rejecting the pessimistic evaluation of the perspective of developed societies which grows out of limited resources and pollution of the environment. As evidence, the author cites numerous results of research done by various specialists on the natural resources of the planet which show insufficient study of the latter, in particular of fossil fuel resources and new types of energy and the possibility of intensifying their use--for example, future increase in the crop capacity of agricultural lands. The latter, in particular, permits the author to speak of the possibility--if the system of agricultural management is perfected and the area of arable land on the planet increased--that by the

beginning of the next century the world will be able to ensure food for a much greater number of people than the world's present population (p. 64). However, the author insufficiently links the given problem to social questions.

T. S. Khachaturov justly notes that a necessary condition for ensuring food is perfecting the system of agricultural management. An effective solution to this problem, as well as that of distributing agricultural produce, is possible only under conditions of socialism. Under capitalism, as the author's analysis of bourgeois "growth theories", etc., confirms, the insufficiency of natural resources and their misuse give rise to the theories of growth suspension or reduction in production volume.

The rich factual material on the natural resources of the USSR is contained in Chapter 4 where detailed data on the presence of resources, their quantity and quality, territorial distribution and accessibility for use are given.

Under conditions of a growth in demand for natural resources, two problems arise which the author examines in their interrelationship: determining the most economical means for using natural resources (substituting for a scarce resource one which is less scarce, using a secondary resource, etc.) and preserving the environment (detecting and rendering harmless polluting substances, etc.). The analysis done by T. S. Khachaturov of the most effective trends in the economy of fuel energy, water, forest and other types of natural resources, reductions in loss of agricultural products and metals, reduction of waste in resource-using fields will undoubtedly be of great scientific and practical interest.

In accordance with the USSR Constitution, nature conservation is in the interest of present and future generations. In conjunction with this, the author rightly includes in his book a review of the problems of population and labor resources--their dynamics, changes in birth rates, mortality rates--for the country as a whole, as well as for individual republics.

Perfecting the economic mechanism is an important condition for increasing the level of rationality in nature management. Until now a comprehensive analysis of the economic mechanism has been lacking which includes control, planning, evaluation of natural resources, calculation of absolute and comparative economic effectiveness of conservation measures taken. These measures are elucidated in the book reviewed here. T. S. Khachaturov particularly stresses the necessity to make economic calculations in the process of adopting planned solutions for the rational use of natural resources and the preservation of nature, devoting particular attention to the problem of evaluating natural resources, one method of which is presented in the book.

The author classifies the types of economic and social harm done to the national economy by pollution, and different methodological principles for determining them are investigated. A comparison of the extent of damage averted as a result of reduction in pollution of the air and watershed with the expenditures necessary for this permits T. S. Khachaturov to come to a conclusion about short term capital investments for the purpose of nature conservation.

After this type of comparison, he proposes to establish a connection between national economic effectiveness of expenditures for nature conservation and economic indices of the operation of polluting enterprises.

Thus, in the book the idea is consistently adhered to of the necessity of economic analysis in nature management, in particular in substantiation of the effectiveness of nature management measures in the process of using and conserving natural resources, as well as for economic stimulation of environmental conservation.

The basic direction of rational use and conservation of natural resources is the gradual conversion to integrated small or no-waste production. It is fair to assert that only under conditions of rational use at all its stages--from extraction to processing to receipt of the finished product--will it be possible to achieve actual economical use of natural resources and increase the level of ensuring them to the national economy. T. S. Khachaturov illuminates several aspects of conversion in a closed system. The interrelationship of the problems of recycling raw materials and creating new production centers in which the production forces are distributed rationally and in which progressive scientific and technological possibilities in the area of natural resource conservation are used is examined separately.

The book as a whole deserves serious attention, although the breadth of scope of problems touched upon causes several questions to be treated with insufficient detail. However, this does not diminish the significance of the work for further perfecting the rational use and conservation of the natural resources of our country.

Scholars and workers in planning and economic agencies, social science teachers and all who are interested in nature conservation will read the book with interest and benefit.

12318
CSO: 1820/34

GOSPLAN OFFICIAL ON SCIENTIFIC-TECHNICAL PROGRESS MANAGEMENT

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 12, Dec 83 pp 54-60

[Article by R. Kozhevnikov, chief of a subdivision of the USSR Gosplan and candidate of economic sciences: "Economic Management of Scientific and Technical Progress"]

[Text] At present, intensification of public production has been defined as the basic direction for development of the country's economy, which places scientific and technical progress at a qualitatively new level in the system of the national economy. The effect of rates and proportions of development of the economic system is reinforced precisely through broad utilization of the achievements of science and technology, active renovation of production, an increase in the technical level, the introduction of advanced technology and highly productive equipment, and improvement in the organization of production and labor.

More than 1,000 targets for the assimilation of new types of output and more than 3,000 targets for the introduction of new processing methods and measures for production automation have been included in the plan for 1983. In all, taking the plans of ministries and departments into account, it is planned to assimilate about 4,000 new types of machines, equipment, instruments and materials. It is planned to remove from production more than 2,000 descriptions of obsolete items (an average of 1,800 types of items were removed annually in the 10th Five-Year Plan). The economy being planned from reduction of production cost of industrial output through measures of scientific and technical progress amounts to 3.5 billion rubles, as opposed to 3.4 billion rubles under the plan for 1982. The relative number of workers in the national economy released by virtue of this factor will be approximately 2.4 million, including 850,000 persons in industry. The proportion of output of the highest quality category in the overall volume of output will be increased from 15.5 to 16.5 percent.

All this dictates higher requirements for management of scientific and technical progress, objective selection of efficient economic measures, comprehensive planning and thorough evaluation of the results of their introduction. In the CPSU Central Committee and USSR Council of Ministers decree "On measures to accelerate scientific and technical progress in the national economy" a number

of important planning, organizational and economic tasks were stipulated for further improvement in the level of planning the development of science and technology, for expansion of the scope of use of programmed and special-purpose management methods, for overall resolution of the scientific and technical problems of an intersectorial nature, for reduction of periods for assimilation of highly efficient inventions, and for consolidation of planning discipline and reinforcement of the responsibility of enterprises, associations, ministries and departments for accelerating the introduction of scientific and technical achievements in the national economy.

In this regard, economic estimates and substantiations assume great importance as integral evaluations of the effectiveness of scientific and technical measures, which will make it possible to utilize them as an effective tool in formulating economically justified policy in the field of scientific and technical progress. The decree notes especially the need for the most expeditious completion of systematic work to comprehensively evaluate the effectiveness of measures aimed at accelerating introduction of scientific achievements, with a system of interrelated indicators established on unified principles which take economic, social and other factors into account.

Meanwhile, the procedure of drafting a plan in the scientific and technical progress part traditionally has been oriented basically toward the organizational-technical content of the planned target for carrying out individual economic measures or the sum total of them. In the process, principal attention is devoted to organization of operations in accordance with those who perform them, the periods for carrying out individual stages, the provision of resources, the scope of introduction, and the like. The effectiveness of a measure in the form of the economic result from its utilization in the national economy appears as a derivative of the implementation of an engineering solution which has already been prepared, that is, effectiveness is not being given, but obtained.

As a consequence of this, the selection of individual scientific and technical measures which have not undergone a preliminary economic appraisal, as a rule, does not ensure the level being required for indicators of production efficiency. And the organs of management which draft the measures cited do not bear direct responsibility for their low economic return. For example, analysis of the drafts of tekhpromfinplany [technical industrial financial plans] of enterprises and associations in a number of sectors for 1982 showed that the engineering services responsible for raising the technical level of production had proposed measures which provided for an increase in labor productivity and reduction of output production cost by only 30-40 percent of the directive target. The effect of measures of higher levels of sectorial management originally proposed by engineering and technical services to achieve the planned growth rates in production efficiency indicators for the current five-year plan is approximately the same.

Consequently, it is fundamentally important in planning scientific and technical measures to quantitatively evaluate their economic efficiency. Planned targets must be examined as a social order of the national economy, determining the role and place of scientific and technical progress in improving public production efficiency.

Under such an arrangement, it is legitimate to presume that the programmed and special-purpose principle of management, with all its basic characteristics, will be put into effect. As an objective, the quantitative target for achieving a definite level for economic indicators of production efficiency stands out in the process. And the selection of specific scientific and technical measures is the program which ensures that the objective cited is put into effect. The objective and the program, having a more general nature at the upper levels, are detailed to the extent that the hierarchy of management is reduced. Thus, while sectorial targets for an increase in labor productivity, reduction of output production cost and materials-intensiveness, and so forth may be based on consolidated estimates of well-known factors (an increase in the technical level of production, improvement in the organization of production and labor, and so forth), at the level of enterprises the estimates require specific measures which quantitatively confirm that fulfillment of planned targets is really ensured.

In this case, a consolidated scheme for formulating a plan of measures of scientific and technical progress is presented as follows:

functional organs of management, which shape the state plan for economic and social development, determine by means of reference figures the basic indicators of production efficiency which are being carried out by virtue of scientific and technical progress factors;

engineering and technical organs of management outline specific measures providing for the assigned level of production efficiency indicators, which is demonstrated by the compulsory quantitative miscalculation of economic results from their introduction; and

functional organs of management, in considering the plan draft and evaluating its soundness and balance, verify the conformity of the overall effectiveness of measures to the targets distributed. In case of nonconformity, the plan drafts are returned for elaboration and after the necessary additions are introduced the economic results are made more precise for formalization as a directive planned target.

Such a reorientation of the planning system to the priority of the economic criteria of efficiency is a necessary condition to improve efficiency in the management of scientific and technical progress, resting upon quantitative substantiation of the solutions being approved. Generalized economic evaluations are conceived as the most acceptable tool in shaping technical policy aimed at intensive development of public production.

Implementation of these requirements for the planning of scientific and technical progress has been reflected in a combination of measures stipulated by the CPSU Central Committee and USSR Council of Ministers decree on improvement in the economic mechanism. In conformity with the decree, a new system of indicators and economic standards oriented toward achievement of national economic end results is being established for ministries and departments, as

well as for associations, enterprises and organizations. In the section of the plan on introduction of new technology, the economic gain from carrying out scientific and technical measures is being used as such an indicator. This same indicator assumes a most important role in the planning and economic stimulation of scientific research and planning and design organizations being shifted to a cost accounting system of work organization.

At the present time there is some experience in planning indicators of economic gain. In the state plan of economic and social development for the current five-year plan, the indicator cited for industrial ministries has been approved in the form of savings from reduction of production cost by putting into effect scientific and technical measures aimed at raising the technical level of production, including the introduction of advanced technology, mechanization and automation of production processes, modernization of operating equipment, and so forth.

This has been reflected positively in the dynamics of the indicators of economic gain. In 1982 the savings from reduction of production cost through measures to increase the technical level of production amounted to 109.8 percent compared with 1981, whereas they were practically stabilized in the years of the 10th Five-Year Plan. The Ministry of Chemical and Petroleum Machine Building, the USSR Ministry of Light Industry, the Ministry of Instrument Making, Automation Equipment, and Control Systems, and other sectors coped with the planned target successfully. At the same time, a number of ministries and departments did not fulfill the plan; on the whole for them, efficiency evaluated by the relationship of economic gain to expenditures for introduction decreased by 7.4 percent.

Without dwelling at length on the reasons for the low plan discipline and responsibility of individual links in the economic system for fulfillment of directive indicators, the inadequate work completion [otrabotannost'] of the planning mechanism in management of the economic efficiency of scientific and technical measures and its poor orientation toward every possible intensification of public production should be noted, however. For the present, this mechanism works as a model of management, taking into account the extensive development of an economic objective. The overall magnitude of the gain, that is, its quantitative measure, close in its content to the volume indicators being used as an operating system of management for evaluating the scope of industrial production and its potential, is established as the planned target. At the same time, the "fee" for the gain in the form of expenditures of all types of resources--labor, material, financial and so forth--is not taken into account or taken into account inadequately. But after all, precisely the "gain-expenditures" relationship primarily characterizes the efficiency of public production and the measure of influence of intensive factors on the rates and proportions of development of the national economy. Thus the effectiveness of scientific and technical progress has not yet become a direct objective of planning. A gradual reorganization of the procedure for drawing up a plan will be required for this.

In the first stage, a thorough retrospective analysis of the indicator of efficiency, bringing to light the basic factors which determine its level and the trends of changes, will have to be conducted. In this stage, the content of the indicator being planned is not changed, but preparation has been directed primarily at formation of a data bank necessary to increase the validity of planned targets in accordance with the magnitude of the economic gain and a forecast of the level of efficiency for the long term. Directive planning of the economic gain indicator already has stimulated work to create a data bank and utilize it in various planning estimates. In particular, forecast estimates of the economic efficiency of scientific and technical measures aimed at raising the technical level of production have been made on the basis of retrospective analysis. These results have been used to prepare initial data on economic gains for the 12th Five-Year Plan. As a rule, such work is conducted in ministries, departments and union republics within the limits of development of an ASPR [automatic system of planning estimates], often with the use of modern computer technology.

THe next stage in reorganization of the procedure of planning economic gain is ensuring its coordination with expenditures. In practice this means that the planned target for economic gain should have a fixed magnitude of expenditures to carry out scientific and technical measures, in accordance with the basic sources of financing as well: the unified fund for development of science and technology (YeFRNT), centralized capital investments, a production development fund, and so forth. A change in the planned target for economic gain requires corresponding adjustments in planned expenditures. The planned level of efficiency, that is, the relationship of planned gain to planned expenditures, is the criterion which determines the extent of adjustments. The operation of this mecnanism may be illustrated in the following manner.

In drafting the annual plan a sector advances a proposal to increase the planned target for economic gain in comparison with the level stipulated by the five-year plan. While economic measures which ensure an above-plan increase in economic gain are financed from the YeFRNT, the sector must increase the planned expenditures from this fund to a magnitude equal to the relationship of increase in economic gain to the planned level of efficient expenditures. Similarly, the centralized capital investments for renovation and technical re-equipment of industrial enterprises stipulated in the five-year plan may be reduced for a sector if in the annual plan the economic gain from measures to increase the technical level of production is lower than the five-year plan targets.

A characteristic of this stage is the more complete balancing of the planned targets in the part of the magnitude of the economic gain and funds for the conduct of scientific and technical measures, which is ensured by appropriate coordination of the plans for economic gain with the standards of formation of the YeFRNT and with plans for capital investment, and primarily allocated for technical re-equipment and renovation of operating enterprises, and so forth. Under these conditions, the indicator of efficiency shifts from the category of estimated indicators to the category of active planning indicators, which directly affect the provision of resources for measures of scientific and technical progress.

And finally, the concluding stage in reorganization of the procedure of planning economic gain, in our opinion, should envisage repudiation of the establishment of a planned target in accordance with the magnitude of economic gain and a shift to planning a standard of expenditure efficiency. Such a shift fully corresponds to the principle of consolidation of centralized planning with simultaneous extension of operational independence and an increase in the responsibility of associations and enterprises for the end results of work. This is ensured, on one hand, by reinforcement of the role of the generalizing criteria of production efficiency and primarily of such indicators as increase in profit and reduction of production cost, and on the other hand, by the independence of enterprises in selecting specific measures necessary to achieve the indicators cited. The funds for conducting scientific and technical measures of a sector, association and enterprise should be obtained in strict conformity with the approved standard of expenditure efficiency. Taking this into account, the standard of efficiency becomes the natural criterion for selection of scientific and technical measures in resolving the problem of the advisability of introducing them, a distinctive economic filter which protects production from inefficient solutions. Favorable conditions are thereby created for bringing to light and putting into effect the internal reserves of production, which is the most important indication of the utilization of intensive factors of development.

Such changes in the planning procedure make increased demands on the methodical provision of estimates of the economic efficiency of measures of scientific and technical progress. At present, a number of directive documents which contain a methodical solution in conformity with individual types of activity regulate the practice of estimates of economic efficiency. However, these documents were introduced at different times and have taken into account the specific conditions of both the manifestation of economic gain and its utilization as well. This often disrupts their methodical unity and misrepresents the normative basis being used, which as a result leads to a decrease in the authenticity of the end results of estimates.

Fundamental attention in the methods in effect (including the procedure and standard elements of estimates, the standards and indicators being applied, examples of the evaluation of individual measures, and so forth) has been devoted to determination of economic gain, based on comparison of expenditures in accordance with basic and new technology. Without casting doubt on the merit of the method of expenditures made in resolving such problems as economic substantiation of the best alternatives for the creation and introduction of new technology, improvement in pricing, and evaluation of the NIOKR [scientific research and experimental design work], let us note that inadequate coordination with directive indicators of the management system in effect sharply limits opportunities to apply this indicator for purposes of planning and accounting. Repudiation of the broad use in planning of the expenditures cited is related to the fact that this indicator is not a real magnitude but a potential one, and reflects savings acquired by the national economy if one path of technical development or another is selected. The potential nature of this gain also is determined by the fact that it is estimated with respect not to equipment actually being replaced, but to some domestic or foreign equipment which is better in its technical and operational indicators.

Consequently, for efficient management of the economics of creating and introducing new technology, the methodical provision in effect must accurately define the economic content of the gain and differentiate the field of their utilization and the procedure of calculation. At the same time, as a cost accounting gain, the use of an indicator of profit increase which most completely reflects an enterprise collective's own efforts aimed at increasing the technical level and efficiency of production is preferable. The quantitative magnitude of this indicator for the consumer is evaluated by the reduction in the production cost of industrial output manufactured with the aid of new technology, and for the manufacturer, it is evaluated by the price markup, which takes into account the higher efficiency of the new technology in relation to the technology replaced.

In the preparation of methodical documents it is advisable to introduce a number of more precise definitions, the necessity for which was revealed in the practice of estimating economic efficiency and applying its results. In particular, this concerns the service lives of equipment taken into account in estimates in the form of a proportion of the deductions for complete replacement of its value. The indicator cited is increased by a standardized ratio of economic efficiency both for new technology as well as for the basic technology. In practice this means that for the service life of equipment a limit which cannot exceed the standardized recovery period is introduced.

The economic advisability of such a limitation, especially for sectors which have been oriented toward production of machine-building output, does not give rise to doubt, inasmuch as it is obvious that an innovation in technology must be retained for a period which does not exceed the standardized recovery period. However, one cannot help but take into account that in the process the service lives of equipment are substantially misrepresented: if they amount to 3 years, the estimated value of the indicator cited is 1.5 times lower than the actual one; the corresponding figures are twice as low for 7 years and 2.5 times lower for 10 years, and so forth.

In our opinion, this contradiction may be resolved if the standardized ratio of efficiency is viewed not as a constant magnitude which increases the proportion of deductions for renovation, but as a limitation of it. Consequently, in estimates of economic efficiency, the proportion of renovation should be defined in strict proportion to the service life, but it cannot exceed the standardized ratio of efficiency, which will make it possible, in not misrepresenting the actual service lives of basic and new equipment, to limit them to the standardized recovery period.

Improving the validity of planned targets for the economic efficiency of scientific and technical measures is closely related to the problems of accounting and accountability for the actual economic gain of new technology. Unfortunately, the system of statistical accountability in force does not completely meet the requirements of the planned management of scientific and technical progress. Thus, the quarterly reporting will contain indicators for fulfillment of the planned target for introducing new technology in part of the volume of work performed and expenditures for introduction of measures without an evaluation of their economic efficiency. The actual gain for new technology

is taken into account only in the annual form of statistical accountability, which sharply reduces opportunities for effective control over the course of fulfillment of the planned target in accordance with this indicator.

Existing accountability traditionally limits information on expenditures for the conduct of scientific and technical measures by capital investments. Obviously, an increase in requirements for evaluation of efficiency gives rise to the need for having complete information on statistical reporting on all expenditures related to the introduction of new equipment and technology, including, for example, the assets of the unified fund for the development of science and technology. Especially since the proportion of these funds in the YeFRNT of industrial sectors is very substantial and has a tendency to increase.

The methodical problems of calculating a decrease in production cost from the use of new technology require more accurate solution as well. In planning, economy is determined in accordance with all forms of changing expenditures for raw material, materials, fuel, power, wages, and other production inputs directly related to the measures being carried out. In the account, the economy from a decrease in production cost as a result of introducing scientific and technical measures is usually determined in accordance with the complete production cost of industrial output. And the authenticity of accounting indicators which characterize the actual economic efficiency of new equipment is inadequate. As a check of a number of enterprises has shown, economic gain often is taken on the level of the planned (expected) value of this indicator, determined in the stage of creating new technology. The gain expected usually is overstated, and in the majority of cases its estimates are based not on accounting data, but on approximate evaluations made by enterprises' technical services.

Thus, the proposals for more accurate determination of the economic content of cost accounting gain, the procedures for its calculation and the fields of application also are correct for the actual gain. For this reason, it would be advisable to take them into account in preparing new wording of the standard method for determining economic efficiency or in the drafting of independent methodical regulations on the calculation of the planned and actual gain of new technology.

8936
CSO: 1820/42

END

END OF FICHE DATE FILMED

7 MARCH 1984